Listing of Claims

1. (Currently Amended) A method of calibrating modules of a modular microwave transceiver, a first module of said modules being one of the group consisting of an RF module and IF module, comprising the steps of:

for a first predetermined number of the first module, determining[[e]] a composite calibration table for the module, the composite calibration table being determined based on over-temperature calibration values across an incremental range of power for an incremental range of frequencies, repeated for an incremental range of temperatures; and

for a production unit of the first module, determining[[e]] a unit calibration table for the module, the unit calibration table being determined based on single-temperature calibration values across an incremental range of power for an incremental range of frequencies, interpolated against the composite calibration table.

2. (Original) The method of claim 1, wherein the first module is an IF module, and the single-temperature calibration values are determined by the steps comprising:

(a) initializing the IF module for transmit calibration by applying a first input signal, setting closed loop power control attenuation to a minimum, and storing the output power as a first reference power level.

3. (Currently Amended) The method of claim 2, further comprising: (b) for each attenuator operable to provide closed loop transmit power control, (i) adjusting the attenuator until module output power decreases a predetermined minimum amount, and storing a control value of the attenuator as a first minimum control value; (ii) further adjusting the attenuator until module output power decreases a predetermined incremental amount, and storing a control value of the attenuator as a first incremental control value; and (iii) incrementing the first input signal power across a range of powers and for each incremented power repeating steps (b)(i)-(ii).

4. (Original) The method of claim 3, wherein each attenuator of step (b) is an analog attenuator, the steps of storing comprising storing DAC (digital to analog converter) control values for each analog attenuator.

5. (Currently Amended) The method of claim [[2]] 3, wherein for each of the first predetermined number of the first module, calibration values are determined using steps (a) and (b) of claims 2 and 3 for a first temperature, and repeating steps (a) and (b) for predetermined other temperatures, and wherein the composite calibration table is determined by storing an average value for all of the first predetermined number of first modules for each calibration value at approximately the same temperature, frequency, input power and attenuation.

6. (Original) The method of claim 1, wherein the first module is an IF module, and the single-temperature calibration values are determined by the steps comprising:

(a) calibrating an IF AGC detector using a predetermined IF input power and adjusting an associated attenuator to achieve preselected IF output power levels, and storing attenuator control values for each of the preselected IF output power levels;

(b) calibrating an IF RSL detector by maintaining constant attenuation and incrementing IF input power across a range of power, and storing RSSI control and voltage values for each of a preselected set of IF input power levels; and

(c) calibrating an IF attenuator dynamic range by setting the IF input power to a predetermined value, and determining and storing for each of plural attenuators maximum, minimum and delta control values by incrementing each of said attenuators from minimum to maximum attenuation.

7. (Original) The method of claim 1, wherein the first module is an RF receive module, and the single-temperature calibration values are determined by the steps comprising, for each of preselected frequencies,

(a) determining a first attenuator control value based on a predetermined total module gain value achieved at a preselected input power level; and

(b) incrementing a second attenuator across a predetermined dynamic range and storing second attenuator control values for each increment.

8. (Original) The method of claim 1, wherein the first module is an RF transmit module, and the single-temperature calibration values are determined by the steps comprising, for each of preselected frequencies,

(a) calibrating an RF attenuator by setting the RF input power to a predetermined value and incrementing the RF attenuator across a predetermined dynamic range and storing RF attenuator control values for each increment;

(b) calibrating an IF detector by setting the RF attenuator to a predetermined target value, adjusting the IF input power to achieve a predetermined output power level, and incrementing the IF input power across a predetermined dynamic range and storing IF detector control values for each increment; and

(c) calibrating an RF detector by setting the RF attenuator to a predetermined target value, and adjusting the IF input power to achieve a predetermined output power level, and incrementing the IF input power across a predetermined dynamic range and storing RF detector control values for each increment.

9. (Original) The method of claim 8, wherein the step of adjusting the IF input power in step (c) comprises adjusting the IF input power for plural modulations, thereby (i) adjusting the IF input power to achieve a predetermined first modulation output power level, and incrementing the IF input power across a predetermined dynamic range and storing first modulation RF detector control values for each increment; and (ii) adjusting the IF input power to achieve a predetermined second modulation output power level, and incrementing the IF input power across a second predetermined dynamic range and storing second modulation RF detector control values for each increment.

10. (Original) A method of calibrating a wide-range communications unit, a first module of said unit being one of the group consisting of a transmit module and a receive module, comprising the steps of:

for a production unit of the first module, determining a unit calibration table for the module, the unit calibration table being determined based on an interpolation using (i) a composite calibration table, derived from calibration measurements of a sample group of the first module at a first number of temperature settings over a range of temperatures, and (ii) unit

calibration values across an incremental range of power for an incremental range of frequencies at a second number of temperature settings less than the first number of temperature settings.

11. (Original) The method of claim 10, wherein the second number of temperature settings is one and the calibration values are determined while each unit is approximately at room temperature.

12. (Original) The method of claim 11, wherein the first module is an IF module, and the unit calibration values are determined by the steps comprising:

(a) initializing the IF module for transmit calibration by applying a first input signal, setting closed loop power control attenuation to a minimum, and storing the output power as a first reference power level.

13. (Currently Amended) The method of claim 12, further comprising: (b) for each attenuator operable to provide closed loop transmit power control, (i) adjusting the attenuator until module output power decreases a predetermined minimum amount, and storing a control value of the attenuator as a first minimum control value; (ii) further adjusting the attenuator until module output power decreases a predetermined incremental amount, and storing a control value of the attenuator as a first incremental control value; and (iii) incrementing the first input signal power across a range of powers and for each incremented power repeating steps (b)(i)-(ii).

14. (Original) The method of claim 13, wherein each attenuator of step (b) is an analog attenuator, the steps of storing comprising storing DAC (digital to analog converter) control values for each analog attenuator.

15. (Currently Amended) The method of claim [[12]] 13, wherein for each of the first predetermined number of the first module, calibration values are determined using steps (a) and (b) of claims 12 and 13 for a first temperature, and repeating steps (a) and (b) for predetermined other temperatures, and wherein the composite calibration table is determined by storing an average value for all of the first predetermined number of first modules for each calibration value at approximately the same temperature, frequency, input power and attenuation.

16. (Original) The method of claim 11, wherein the first module is an IF module, and the unit calibration values are determined by the steps comprising:

(a) calibrating an IF AGC detector using a predetermined IF input power and adjusting an associated attenuator to achieve preselected IF output power levels, and storing attenuator control values for each of the preselected IF output power levels;

(b) calibrating an IF RSL detector by maintaining constant attenuation and incrementing IF input power across a range of power, and storing RSSI control and voltage values for each of a preselected set of IF input power levels; and

(c) calibrating an IF attenuator dynamic range by setting the IF input power to a predetermined value, and determining and storing for each of plural attenuators maximum, minimum and delta control values by incrementing each of said attenuators from minimum to maximum attenuation.

17. (Original) The method of claim 11, wherein the first module is an RF receive module, and the unit calibration values are determined by the steps comprising, for each of preselected frequencies,

(a) determining a first attenuator control value based on a predetermined total module gain value achieved at a preselected input power level; and

(b) incrementing a second attenuator across a predetermined dynamic range and storing second attenuator control values for each increment.

18. (Original) The method of claim 11, wherein the first module is an RF transmit module, and the unit calibration values are determined by the steps comprising, for each of preselected frequencies,

(a) calibrating an RF attenuator by setting the RF input power to a predetermined value and incrementing the RF attenuator across a predetermined dynamic range and storing RF attenuator control values for each increment;

(b) calibrating an IF detector by setting the RF attenuator to a predetermined target value, adjusting the IF input power to achieve a predetermined output power level, and incrementing the IF input power across a predetermined dynamic range and storing IF detector

control values for each increment; and

(c) calibrating an RF detector by setting the RF attenuator to a predetermined target value, and adjusting the IF input power to achieve a predetermined output power level, and incrementing the IF input power across a predetermined dynamic range and storing RF detector control values for each increment.

19. (Original) A system for calibrating radio modules from one of the group consisting of an RF module and IF module, operable in a wide-range microwave transceiver, comprising:

a first radio module comprising a calibration memory and radio circuitry, the radio circuitry consisting of one of the group of RF transmit, RF receive, IF transmit, and IF receive circuitry;

a test signal processing system comprising a signal generator, measuring unit, memory, and a processor and instructions; and

a connector, operably coupling the first radio module to the test signal processing system; wherein the processor is operably configured to execute the instructions when the test signal processing system is operably coupled to the first radio module,

wherein the instructions are operable for controlling the signal generator to supply a series of test signals to the first radio module, for controlling the radio circuitry to set attenuation values, for controlling the measuring unit to determine characteristics of the radio circuitry based on the series of test signals, for determining calibration values based on the series of test signals, attenuation values, and the determined characteristics of the radio circuitry, and for storing the calibration values in the calibration memory of the first radio module.

20. (Original) The system of claim 19, wherein the first radio module is one of the group consisting of a transmit module and a receive module, and wherein the instructions are operable for determining a unit calibration table for the first radio module, the unit calibration table being determined based on an interpolation using (i) a composite calibration table, derived from calibration measurements of a first predetermined number of the first module at a first group of temperature settings over a range of temperatures, and (ii) unit calibration values across an incremental range of power for an incremental range of frequencies at a second group of temperature settings less than the first number of temperature settings.

21. (Original) The system of claim 20, wherein the second group of temperature settings is one and the instructions are operable for determining the calibration values while each unit is approximately at room temperature.

22. (Original) The system of claim 20, wherein the first radio module is an IF module, and the instructions are further operable for determining unit calibration values by:

(a) initializing the IF module for transmit calibration by applying a first input signal, setting closed loop power control attenuation to a minimum, and storing the output power as a first reference power level.

23. (Currently Amended) The system of claim 22, wherein instructions are further operable for determining unit calibration values by: (b) for each attenuator operable to provide closed loop transmit power control, (i) adjusting the attenuator until module output power decreases a predetermined minimum amount, and storing a control value of the attenuator as a first minimum control value; (ii) further adjusting the attenuator until module output power decreases a predetermined incremental amount, and storing a control value of the attenuator as a first incremental control value; and (iii) incrementing the first input signal power across a range of powers and for each incremented power repeating steps (b)(i)-(ii).

24. (Currently Amended) The system of claim [[20]] 23, wherein for each of the first predetermined number of the first module, the instructions are further operable for determining calibration values using routines (a) and (b) of claims 21 and 22 for a first temperature, and repeating routines (a) and (b) for predetermined other temperatures, and wherein the instructions are further operable for determining the composite calibration table by storing an average value for all of the first predetermined number of first modules for each calibration value at approximately the same temperature, frequency, input power and attenuation.

25. (Original) The system of claim 20, wherein the first module is an IF module, and the instructions are further operable for determining unit calibration values by routines for:

(a) calibrating an IF AGC detector using a predetermined IF input power and adjusting an associated attenuator to achieve preselected IF output power levels, and storing attenuator control values for each of the preselected IF output power levels;

(b) calibrating an IF RSL detector by maintaining constant attenuation and incrementing IF input power across a range of power, and storing RSSI control and voltage values for each of a preselected set of IF input power levels; and

(c) calibrating an IF attenuator dynamic range by setting the IF input power to a predetermined value, and determining and storing for each of plural attenuators maximum, minimum and delta control values by incrementing each of said attenuators from minimum to maximum attenuation.

26. (Original) The system of claim 20, wherein the first module is an RF receive module, and the instructions are further operable for determining unit calibration values by, for each of preselected frequencies,

(a) determining a first attenuator control value based on a predetermined total module gain value achieved at a preselected input power level; and

(b) incrementing a second attenuator across a predetermined dynamic range and storing second attenuator control values for each increment.

27. (Original) The system of claim 20, wherein the first module is an RF transmit module, and the instructions are further operable for determining unit calibration values by, for each of preselected frequencies,

(a) calibrating an RF attenuator by setting the RF input power to a predetermined value and incrementing the RF attenuator across a predetermined dynamic range and storing RF attenuator control values for each increment;

(b) calibrating an IF detector by setting the RF attenuator to a predetermined target value, adjusting the IF input power to achieve a predetermined output power level, and incrementing the IF input power across a predetermined dynamic range and storing IF detector control values for each increment; and

(c) calibrating an RF detector by setting the RF attenuator to a predetermined target value, and adjusting the IF input power to achieve a predetermined output power level, and incrementing the IF input power across a predetermined dynamic range and storing RF detector control values for each increment.

28. (Withdrawn) A method of operating a modular wide-range microwave transceiver, each having precalibrated modules, comprising the steps of:

coupling the precalibrated modules to form a radio unit, each module having a module memory storing predetermined calibration values;

coupling the radio unit to a signal processing unit;

determining a first attenuation value by adjusting a first transmit attenuator to achieve a predetermined target output of a AGC detector, and storing the first attenuation value in a first module memory; and

when an RF loopback switch is coupled as part of the radio unit, determining a received signal level (RSL) correction factor and transmit output power correction factor based on a loop-back switch insertion loss.